

Claims

1. An ambient dry paint coating composition substantially free of volatile organic coalescing solvent, the paint having a film forming polymeric binder comprising by weight:
 - an aqueous emulsion polymeric film forming matrix polymer of copolymerized ethylenically unsaturated monomers; and
 - at least 3% of a low molecular weight poly(hydroxy alkanoic acid) oligomer of copolymerized hydroxy alkanoic acid having from 2 to 4 carbon atoms and being an external modifier of the matrix polymer, the oligomer having number average molecular weight between about 300 and 10,000 and a Tg below about 0°C, the oligomer having terminal alkyl aliphatic ester groups where the alkyl chain has from 3 to 20 carbon atoms, where the mixture of the oligomer and the matrix polymer are film forming and provide an air dry coating composition substantially free of organic coalescing solvent.
2. The paint coating composition of claim 1 where the oligomer comprises between 5% and 20% by weight of the film forming polymeric binder mixture.
3. The paint coating composition of claim 2 where the oligomer has a molecular weight between about 300 and 2,000.
4. The paint coating composition of claim 3 where the oligomer has a number average molecular weight between 500 and 1,000.
5. The paint coating composition of claim 1 where the alkyl chain of the terminal alkyl ester group has from 8 to 12 carbon atoms.
6. The coating composition of claim 1 where the poly(hydroxy alkanoic acid) oligomer comprises poly(lactic acid).

7. The paint coating composition of claim 6 comprising from 5% to 20% by weight oligomer based on the total weight of oligomer and matrix polymer.
8. The paint coating composition of claim 6 where the molecular weight of the poly(lactic acid) oligomer is between 300 and 20,000.
9. The paint composition of claim 6 where the molecular weight of the poly(lactic acid) oligomer is between 500 and 1,000.
10. The paint composition of claim 6 where the poly(lactic acid) oligomer comprises from 3 to 15 copolymerized lactic acid monomeric units.
11. The paint composition of claim 6 where the poly(lactic acid) oligomer comprises a copolymer of polymerized lactic acid with lesser amounts of hydroxyalkanoic acid other than lactic acid.
12. The paint composition of claim 11 where the hydroxyalkanoic acid is selected from glycolic acid, hydrylic acid, and a hydroxybutyric acid.
13. The paint composition of claim 6 where the oligomer is produced by alkyl alcohol degradative transesterification of a high molecular weight poly(lactic acid) polymer, and the alkyl alcohol is a mono alcohol having an alkyl chain from 3 to 20 carbon atoms.
14. The paint composition of claim 13 where the alkyl alcohol alkyl chain has from 8 to 12 carbon atoms.

15. The paint composition of claim 6 where the oligomer is produced by copolymerizing lactic acid with an alkyl mono alcohol.
16. The paint composition of claim 6 where the oligomer is produced by reacting lactide with alkyl alcohol.
17. The paint composition of claim 1 where the poly(hydroxy alkanoic acid) oligomer comprises poly(glycolic acid).
18. The paint coating composition of claim 17 where the paint comprises from 5% to 20% by weight oligomer based on the total weight of oligomer and matrix polymer.
19. The paint coating composition of claim 17 where the molecular weight of the poly(glycolic acid) oligomer is between 300 and 2,000.
20. The paint composition of claim 17 where the molecular weight of the poly(glycolic acid) oligomer is between 500 and 1,000.
21. The paint composition of claim 17 where the poly(glycolic acid) oligomer comprises from 3 to 15 copolymerized glycolic acid monomeric units.
22. The paint composition of claim 17 where the poly(glycolic acid) oligomer comprises a copolymer of polymerized glycolic acid with lesser amounts of an hydroxyalkanoic acid other than glycolic acid.
23. The paint composition of claim 22 where the hydroxyalkanoic acid is selected from lactic acid, hydrylic acid, and a hydroxybutyric acid.

24. The paint composition of claim 17 where the oligomer is produced by alkyl alcohol degradative transesterification of a high molecular weight poly(glycolic acid) polymer, where the alkyl alcohol has an alkyl chain from 3 to 20 carbon atoms.

25. The paint composition of claim 24 where the alkyl alcohol alkyl chain has from 8 to 12 carbon atoms.

26. The paint composition of claim 24 where the oligomer is produced by copolymerizing glycolic acid in the presence of an alkyl mono alcohol.

27. The paint composition of claim 1 where the poly(hydroxy alkanoic acid) oligomer comprises 3 to 15 copolymerized monomeric units of hydroacrylic acid to produce a poly(hydroacrylic acid) oligomer.

28. The paint composition of claim 27 where the poly(hydroacrylic acid) oligomer is a copolymer of hydroacrylic acid copolymerized with lesser amounts of a hydroxy alkanoic acid other than hydroacrylic acid.

29. The paint composition of claim 1 where the poly(hydroalkanoic acid) oligomer comprises 3 to 15 copolymerized units of hydroxybutyric acid to produce a poly(hydroxybutyric acid) oligomer.

30. The paint composition of claim 29 where the poly(hydroxybutyric acid) oligomer is a copolymer of hydroxybutyric acid copolymerized with lesser amounts of a hydroxy alkanoic acid other than hydroxybutyric acid.

31. An ambient dry paint coating composition containing an oligomeric film forming modifier for a matrix polymer, the paint having a film forming polymeric binder comprising by weight:

an aqueous emulsion polymeric film forming matrix polymer of copolymerized ethylenically unsaturated monomers; and

at least 3% of a low molecular weight poly(hydroxy alkanoic acid) oligomer of copolymerized hydroxy alkanoic acid having from 2 to 4 carbon atoms and being an external modifier of the matrix polymer, the oligomer having number average molecular weight between about 300 and 10,000 and a Tg below about 0°C, the oligomer having terminal alkyl aliphatic ester groups where the alkyl chain has from 3 to 20 carbon atoms, where the mixture of the oligomer and the matrix polymer are film forming and provide an air dry coating composition.

32. In a process for producing an ambient dry aqueous coating composition, the paint having a film forming polymeric matrix polymer of aqueous emulsion copolymerized ethylenically unsaturated monomers, the process comprising:

preforming the film forming matrix polymer; and

mixing with the matrix polymer a low molecular weight poly(hydroxy alkanoic acid) oligomer of copolymerized hydroxy alkanoic acid having from 2 to 4 carbon atoms, to provide a compatible and stable mixture of oligomer and matrix polymer containing at least 3% by weight of oligomer, the oligomer having a number average molecular weight from 300 to 10,000 and terminal alkyl ester groups having an alkyl aliphatic chain from 3 to 20 carbon atoms.

33. The process of claim 32 where the poly(hydroxy alkanoic acid) oligomer comprises copolymerized lactic acid and the aqueous coating composition is substantially free of volatile organic coalescing solvent.

34. The process of claim 33 where the oligomer is produced by alkyl mono alcohol degradative esterification of a high molecular weight poly(lactic acid) polymer having a number average molecular

weight above 21,000 to produce a transesterified low molecular weight oligomer having terminal alkyl aliphatic ester groups.

35. The process of claim 33 where the high molecular weight poly(lactic acid) polymer has a number average molecular weight between about 30,000 and about 100,000, and the alkyl mono alcohol has an alkyl ester chain of 8 to 12 carbon atoms.
36. The process of claim 33 where the oligomer has a molecular weight of 300 to 2,000.
37. The process of claim 33 where the oligomer has a molecular weight of 500 to 1,000.
38. The process of claim 33 where the oligomer is produced by copolymerizing lactic acid with an alkyl mono alcohol having an alkyl group of 3 to 20 carbon atoms to form poly(lactic acid) oligomer having on average from 3 to 15 copolymerized monomeric lactic acid units.
39. The process of claim 33 where the monomeric lactic acid is copolymerized with lesser amounts of hydroxyalkanoic acid other than lactic acid to form the oligomer.
40. The process of claim 33 where the oligomer is produced by reacting an alkyl mono alcohol having from 3 to 20 carbon atoms with lactide.
41. The process of claim 32 where the poly(hydroxy alkanoic acid) oligomer is poly(glycolic acid).
42. The process of claim 41 where the oligomer is produced by alkyl mono alcohol degradative esterification of a high molecular weight poly(glycolic acid) polymer having a number average molecular weight above 21,000 to produce a transesterified low molecular weight poly(glycolic acid) oligomer having terminal alkyl ester groups.

43. The process of claim 41 where the high molecular weight polymer has a number average molecular weight between about 30,000 and 100,000, and the alkyl mono alcohol has an alkyl ester chain of 8 to 12 carbon atoms.

44. The process of claim 41 where the oligomer is produced by copolymerizing glycolic acid with an alkyl mono alcohol having an alkyl group of 3 to 20 carbon atoms to form a poly(glycolic acid) oligomer having on average from 3 to 15 copolymerized monomeric lactic acid units.

45. The process of claim 41 where the monomeric glycolic acid is copolymerized with lesser amounts of a hydroxyalkanoic acid other than glycolic acid to form the poly(glycolic acid) oligomer.

46. The process of claim 32 where the poly(hydroxy alkanoic acid) oligomer comprises copolymerized hydrylic acid.

47. The process of claim 32 where the poly(hydroxy alkanoic acid) oligomer comprises copolymerized hydroxybutyric acid.